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ABSTRACT

This paper reviews highlights of research on teaching conducted in the 1970s, discusses current trends, and considers accomplishments likely to be forthcoming in the 1980s. The latter include better attention to context in collecting classroom data and qualifying its probable generalizability, more and better measurement of progress toward affective outcomes of instruction (in addition to continued attention to cognitive outcomes), development of explanations for process-process and process-outcome linkages presently recognized but not fully understood, and better integration of research on teaching with research on learning. (Author)

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RECENT RESEARCH ON TEACHING

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Abstract

This paper reviews highlights of research on teaching conducted in the 1970's, discusses current trends, and considers accomplishments likely to be forthcoming in the 1980's. The latter include better attention to context in collecting classroom data and qualifying its probable generalizability, more and better measurement of progress toward affective outcomes of instruction (in addition to continued attention to cognitive outcomes), development of explanations for process-process and process-outcome linkages presently recognized but not fully understood, and better integration of research on teaching with research on learning.

RECENT RESEARCH ON TEACHING[1]

Jere Brophy[2]

This is a comment on recent research on teaching, especially research that links teaching processes to their outcomes (student learning and attitudes). Several recent reviews of the major findings of work in this field are available elsewhere (Brophy, 1979a; Good, 1979; Medley, 1979; Peterson & Walberg, 1979; Rosenshine, 1979), as are methodological commentaries (Berliner, 1977; Brophy, 1979b; Doyle, 1977). Consequently, this paper will focus on the possible meanings and implications of this work and on its probable directions in the 1980's.

A Look at the 1970's

The 1970's were a decade of great excitement and progress in research on teaching. For the first time, researchers concentrated on the individual teacher as the unit of analysis (rather than masking individual teacher effects by aggregating data from all teachers working at a given school or using a given curriculum), and, more specifically, collected data based on sustained observation of teacher behavior (rather than pencil and paper measurement of teachers' status characteristics, attitudes, or personalities). They also began to focus more on inservice rather than preservice teachers, which allowed them to study teaching under more naturalistic conditions

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[1]This paper was delivered as an invited presentation to the annual meeting of the Northeastern Educational Research Association, October, 1980. The author wishes to thank June Smith for her assistance in manuscript preparation.

[2]Jere Brophy is coordinator of the Classroom Strategy Study and a professor of student teaching and professional development, and counseling and educational psychology.

and to compare groups who had established contrasting track records of effectiveness as defined by relative success in producing student learning gains on standardized tests. Comparability of data from different teachers was enhanced by exercising control over the contexts within which instruction was to be observed (grade level, subject matter, student status characteristics, time of year) and/or by observing teachers often and long enough to build up a reliable sample of their teaching behavior. Sophisticated, multivariate classroom-observation systems were introduced that (1) combined high inference ratings with low inference coding of specific behaviors, (2) allowed for separate coding and analysis of behavior that occurred in separate contexts, and (3) expressed classroom process measures not merely as frequencies per unit of time but as percentages of the total number of times that the behavior in question might have been observed or expected. These and other methodological improvements (cf. Brophy, 1979 b) used initially in several correlational studies (Brophy & Evertson, 1976; Evertson, Anderson, Anderson, & Brophy, 1979; Good & Grouws, 1977; McDonald & Elias, 1976; Soar & Soar, 1972; Stallings & Kaskowitz, Note 1; Tikunoff, Berliner, & Rist, Note 2), and later in experimental studies (Anderson, Evertson, & Brophy, 1979; Good & Grouws, 1979; Program on Teaching Effectiveness, 1978; Stallings, Cory, Fairweather, & Needels, Note 3) have yielded a reasonably coherent body of data linking specific teacher characteristics and behaviors to student learning of basic skills. Following are a few of the major conclusions from this work.

Teachers Make a Difference

Common sense suggests that some teachers will teach more, or teach more effectively, than others, so that their students will learn more. Yet, in the late 1960's, writers like Stephens (1967) asserted that learning de-

pended almost entirely on events occurring spontaneously within students, so that the identity and behavior of the teacher were almost irrelevant. Data from the Coleman report (Coleman, Campbell, Hobson, McPartland, Mood, Weinfield, & York, 1966) seemed to support this. However, 1970's research, focusing on the teacher as the unit of analysis, established that some teachers are reliably more effective than others. Correlations of class-mean residual-gain scores from one year to the next usually averaged about .30, despite changes in class size and composition, cohort effects unique to specific classes, or teacher health and welfare factors that militate against stability in teacher behavior or teacher effects (Acland, 1976; Veldman & Brophy, 1974).

Teacher Expectations and Role Definitions are Important

Students tend to learn more when their teachers believe that instructing students in the curriculum is basic to the teaching role, expect their students to learn, and act accordingly. These teachers make it their business to see that students master key objectives of the curriculum, reteaching or finding another way to teach if the first approach is not successful. They run businesslike, task-oriented classrooms.

Effective Teachers Keep Students Engaged in Meaningful Tasks

Effective teachers are successful in part because they not only allocate a lot of time for instruction but actually spend most of that time actively instructing the students or supervising their work on assignments. They minimize the time devoted to transitions and other purely procedural matters, and especially the time devoted to dealing with classroom disruptions. In part, they accomplish this by displaying signal continuity, with-

itness, overlappingness, challenge and variety in assignments, and other principles of effective group organization and management defined by Kounin (1970). Much of this boils down to minimizing disruption and off-task behavior through prevention. Students are likely to remain attentive and engaged when their teacher presents an appropriate activity for them to focus on, keeps it moving at a good pace, and monitors their responsiveness.

Recent work by Evertson and Anderson (1979) shows that organizing the classroom to maximize student engagement in meaningful tasks involves a great deal of instruction in classroom procedures and routines, especially in the early grades. It may be necessary for the teacher to begin the year by giving detailed instructions, perhaps supplemented with opportunities for practice and feedback, to teach students when and how to make smooth transitions between activities, sharpen pencils, obtain needed equipment, get help with an assignment, or check their work. Classrooms that seem to run automatically usually result from careful planning, preparation, and direct instruction in these procedures and routines at the beginning of the year, with periodic review as needed.

Task engagement is not enough by itself. Students must be engaged in meaningful tasks if they are going to learn efficiently. Although variety and a degree of challenge are important, the key variable seems to be pacing: Students seem to learn the most when they proceed rapidly but in very small steps. They can answer most (70-80%) of the questions that teachers ask during group activities when they (the teachers) are available to give feedback. In seatwork assignments when students are expected to manage their own learning, success rates approaching 100% are necessary. Seatwork should not be busy work assigned merely to keep students occupied rather than because it provides practice in relevant knowledge or skills, but it should be easy enough for students to experi-

ence success if they apply themselves. Students consistently given work that is too difficult for them can be expected to give up, and eventually to become "motivation problems."

This is well known to educators as a general principle, of course, but recent research on teaching makes a contribution by showing that students require a very high success rate in order to progress efficiently. Theoretical sources vary on this point. The achievement motivation literature suggests that a 50% success rate is optimal for maximizing achievement motivation, at least for individuals who do not fear failure (Crawford, 1978), and this finding has sometimes been inappropriately generalized and transformed into the notion that classroom questions and assignments should be geared to a 50% success rate. Similarly, writers who believe that higher level or thought questions are more valuable than lower level or fact questions frequently state or imply that learning that is "too easy" is likely to be repetitive, boring, or pointless. On the other hand, mastery-learning advocates usually demand at least 80% success on assignments and tasks, and programmed learning advocates expect to approach 100%. Classroom data support the latter position, indicating that teachers who program for 90-100% success rates on student assignments produce better student learning than teachers who tolerate higher failure rates (Fisher, Berliner, Filby, Marliave, Cahen, & Dishaw, Note 4).

The key concept here probably is mastery to the point of overlearning. Basic skills are taught in hierarchically organized and sequenced strands, so that success at any given level usually requires application of concepts and skills mastered at earlier levels. Typically, students are not able to retain and apply concepts and skills unless they have been mastered to the point of overlearning, so it is vital to teach to this level of mastery consistently if consistent success is to be reasonably expected. The

high success rates seen in the classrooms of highly effective teachers exist not only because the teachers avoid challenging students with material that is too difficult for them to handle, but also because the teachers see that students practice new knowledge and skills sufficiently to attain the level of overlearning. Even so, they move through the curriculum at a brisk pace, because they keep students profitably engaged in academic activities most of the time.

Students Need Direct Instruction from the Teacher

In general, students taught with structured curricula do better than those taught with more individualized or discovery learning approaches, and those who receive much of their instruction directly from the teacher do better than those expected to learn on their own or from one another (Bennett, 1976; Brophy & Evertson, 1976; Gage, 1978; Good & Grouws, 1977; Good, 1979; McDonald & Elias, 1976; Rosenshine, 1976; Wright, 1975; Zimmerman & Jaffe, 1977; Stallings & Kaskowitz, Note 1; Stallings, et al., Note 3). It is difficult to imagine how it could be otherwise, despite the appeal and occasional elegance of humanistic and discovery learning theories.

In order to learn independently, students must be able to read, understand, and follow directions; identify key concepts; and correct their own errors. Furthermore, they must be willing and able to sustain sufficient levels of concentration and effort. This combination of ability and motivation does not exist at all among students in the early elementary grades, and probably exists in only a minority of older students. In any case, students apparently learn basic skills most efficiently when systematically taught, monitored, and given feedback by a teacher.

Students in the early grades seem to require a lot of one-to-one dyadic interaction with the teacher, who gives them opportunities for

practice and feedback. For efficiency reasons, most of this dyadic interaction occurs within the small group setting, but it is dyadic interaction nevertheless. At these early grade levels, teachers who call on students to recite in a predetermined patterned order during small group instruction tend to be more successful than teachers who call on students randomly (Anderson, Evertson, & Brophy, 1979; Brophy and Evertson, 1976). In part, this is because the pattern method provides structure to students who may need it and cuts down on the distractions caused by students attempting to coax the teacher to call on them. Perhaps more importantly, however, this method automatically insures that all students participate regularly and roughly equally. Earlier research on the communication of teacher expectations to students (reviewed by Brophy & Good, 1974) showed that teachers who use the random method do not acutally call on students randomly. Instead, they tend to call on high achieving students more often than low achieving students (and to provide longer and higher quality response opportunities when they do call on them), and the more assertive students create more response opportunities for themselves than the shy or withdrawn students do. Calling on students in a predetermined patterned order automatically reduces these discrepancies.

At higher grade levels, the need for dyadic interactions between the teacher and each individual student seems to give way to the need for more briskly paced lessons and activities in which the majority of the teachers' communications are directed to the group or class as a whole rather than to specific individuals. Whole class presentations become the usual setting for introduction of new material, with small group activities being used more for remedial work and extra work with students who have difficulty keeping up. By about fourth grade, and increasingly thereafter, students typically do not have to interact individually with the teacher, but instead are able to learn by paying attention to the teacher's presentation

of information to the group as a whole (typically supplemented by interactions with a few individuals). In fact, at the higher grade levels, it may be counterproductive for teachers to interrupt large group activities for any length of time in order to deal with concerns specific to an individual student, because this may lead to loss of lesson momentum and problems of student inattention and disruption.

At any grade level, then, teachers must optimize their instruction so that they neither present too much too fast nor move too slowly with too much redundancy. The teacher effectiveness research of the 1970's makes it clear that teachers who accomplish this task successfully will produce more learning in their students, but it does not yield much information about how the task can be accomplished. How much new information should be presented to the class in today's lesson? How much and what kind of practice or application opportunities will the class need? Who will need extra help, and what form should this help take? When will the class be ready to move on, and how will the teacher recognize when this point has been reached? These are among the questions that will be addressed in the research of the 1980's, particularly in studies of teachers' planning, thinking, judgment, and decision making (cf. Clark & Yinger, 1977; Shavelson, 1976).

Different Contexts Call for Different Teacher Behavior

One of the major contributions of the research of the 1970's was its attention to context factors that can influence the appropriateness or effectiveness of particular teacher behavior. Under context factors I would place a broad range of variables that would include student individual differences and status characteristics (age, sex, race/ethnicity, social class, intelligence, cognitive style), subject matter, group structure (individual vs. small group vs. whole class), task structure (lecture,

discussion, recitation, drill, seatwork assignment), instructional goals (introduce new material vs. apply new material vs. review vs. generalize to new situations; promote mastery of basic skills vs. promote interest or enrichment through exploratory opportunities), and even time of year (more attention to procedures and mechanics are required early in the year). Few of these context factors have been studied yet, and none has been investigated systematically. When investigators do study such context factors, however, they almost invariably report significant differences in what constitutes effective teaching in the different contexts studied (Brophy & Evertson, 1978).

Some of these context differences combine to form larger patterns, as in the relationship between student age/intelligence/achievement level and the degree to which the student is directly dependent upon the teacher for learning. In general, to the extent that students are younger, less intelligent, and/or less far along in mastering the key objectives of a given curriculum, teachers will need to structure their learning experiences, give more detailed and redundant instructions and explanations, interact more individually and more often with each student, elicit overt responses to questions and performance demands, provide individualized feedback, divide seatwork assignments into smaller segments or devise ways to provide more frequent monitoring and corrective feedback, and, in general, continually direct and supervise learning activities. Older, brighter, and more skilled students can assume more of the burden for managing their own learning, especially once they have made the transition from learning the tool skills as ends in themselves to using the tool skills as means to learn other things.

Several aspects of cognitive development associated with movement from Piaget's preoperational period into the period of concrete operations are also important here. In particular, the development of meta-knowledge, meta-memory, and related skills will enable students to begin to approach learning tasks more systematically and with continuing awareness of what they are trying to accomplish. Improved memory and concentration lead to the ability to work independently longer and on a greater variety of assignments. Other cognitive developments, combined with mastery of subskills to overlearning, allow students to begin to be able to evaluate their work, to know whether or not they understand the task and how to go about solving it, and to check their answers and identify errors.

The fact that students can assume more and more of the responsibility for their own learning as they get older and more knowledgeable does not necessarily mean that they should, however. At least with regard to basic skill mastery, the data indicate that, within any particular grade level, students who get more direct instruction from their teacher will learn more than students who get less direct instruction. Thus, although fourth graders can work more independently than first graders, and eighth graders more so than fourth graders, direct instruction from the teacher remains important in each grade. Even skilled adult learners will learn more efficiently when guided externally (Larkin & Reif, 1976; Tennyson, 1980).

A second major cluster of context-dependent relationships links student personality traits such as confidence-inhibition, assertiveness-shyness, and field independence-field dependence to the teaching style dimensions of demandingness-supportiveness and a businesslike, impersonal style versus an emphasis on warmth and more personalized interactions. Students who

are bright and confident, especially if they also tend toward a field independent cognitive style, tend to prefer to be, and to achieve more when, taught by teachers who are oriented more toward subject matter than individuals, and who are intellectually stimulating but also demanding in their interactions with students. Such teachers challenge their students to stretch themselves intellectually and to put forth the effort required to do the best that they can. Often they are sparing in their praise but detailed in their criticism, although both the praise and the criticism tend to be impersonal and concentrated on the quality of the academic performance in question. By demanding the most from students who are capable and desirous of fulfilling these demands, such teachers tend to get the most from such students.

At the same time, however, they tend to terrorize or alienate other students. This includes all students who lack (or think they lack) the ability to meet the teacher's high standards, but most especially those who are anxious, insecure, or field dependent in cognitive style. These students are frightened and discouraged by demands and criticism, but they respond well to support and encouragement, especially from teachers who get to know them personally and establish themselves as familiar and concerned helpers rather than distant authority figures. The teachers who are most successful with these students get top performance from them not by demanding it (with implied rejection or punishment for failure to deliver), but by fostering it gradually through praise, encouragement, expressions of appreciation for effort and shared pride and happiness for accomplishment, and so on. This kind of support and encouragement seems to be important for anxious or insecure students of any kind in any setting, but especially so for students whose racial/ethnic group or social class membership makes them part of a minority group attending a school dominated

by a majority group from which they are (or feel) excluded (Brophy & Evertson, 1976; Kleinfeld, 1972; Peterson, 1977; Solomon & Kendall, 1979; St. John, 1971; Witkin, Moore, Goodenough, & Cox, 1977).

One way to attempt to respond to this set of relationships would be to try to match teachers to students according to their styles and preferences. This may be especially appropriate at the college level, where choices of instructors teaching the same courses are often available, and where student styles and preferences have become developed to the point that some students will recognize and be able to act on them. However, both logical considerations and empirical data suggest that such matching might not be in the long-run best interests of the students (Brophy, 1978).

The logical problem here is that matching of this kind may reinforce existing styles or preferences and thus make already abnormal individuals more abnormal. In the case of students who are overly anxious or teacher-dependent, this is clearly not desirable. These students should get the support and encouragement they need, but ideally should be gradually weaned away from their dependence. Such students probably will be much better off in the long run if they gradually learn to become more assertive, to make decisions and take responsibility for them, and to advance their ideas even when they may be risking failure or disapproval.

Although it is not as obvious, reinforcement of extremes of traits like assertiveness or field independence can be counterproductive too. Individuals with little interest in or tolerance for the thoughts or feelings of their peers might become better rounded as persons if they learned to pay more attention to social stimuli. In addition to these logical considerations, there are data to indicate that teaching students in the

style to which they are accustomed or the style which they prefer does not necessarily lead to better achievement, even though it might lead to better attitudes (Dorsel, 1975; Peterson, 1977; Peterson & Janicki, 1979).

Thus, attempting to match students to teachers probably is neither feasible nor effective as a solution to the problems of optimizing education raised by data on interactions between learner characteristics and teacher behaviors. Instead, students will probably be better served in the long run if teachers are trained to recognize and respond appropriately to the needs and preferences of each individual student. Ideally, this would include not merely providing students with the kinds of treatment they seem to require (or at least respond well to) at the moment, but also weaning them away from narrow and rigid preferences toward a more flexible and differentiated tolerance for and ability to handle a broad variety of situations and people. Thus, students who need a lot of personalized interaction and support would get it, but even while providing it, the teacher would be gradually weaning them from such dependence and developing assertiveness, frustration tolerance, and self-assessment and reinforcement skills. Similarly, teachers who have been bringing along anxious or alienated students slowly could become more demanding as the students' tolerance for challenge and ability to respond to it improved.

Limits and Qualifications on 1970's Research

The research on teaching of the 1970's represents enormous progress when compared with what was available previously. However, the knowledge accumulated is bounded by some important limitations and qualifications. First, it pertains almost exclusively to instruction in basic skills where the emphasis is on mastery and the curriculum is hierarchically organized and sequenced. Very little is known about what constitutes effective

teaching when the goal is to promote enrichment, discovery, or personalized learning. It does not seem likely that direct instruction will prove to be the most effective method for these purposes.

Affective Outcomes

The research on teaching in the 1970's also was focused mostly on cognitive goals, as measured by student performance on standardized achievement tests. When progress toward affective goals (student attitudes toward the teacher or the subject matter) was investigated, the data revealed that patterns of teaching that maximized positive student attitudes were not the same patterns that maximized student learning (Evertson, Anderson, Anderson, & Brophy, 1979; Good & Grouws, 1977; Fisher, et al. Note 4). This underscores the fact that effective teaching involves optimizing and balancing trade-offs. Beyond a certain point, attempting to maximize student learning will cause students to feel unduly pressured and thus reduce progress toward affective goals. Similarly, teachers who concentrate on maximizing positive student attitudes probably can succeed, but at a cost in progress toward achievement goals. The situation becomes even more complex when other goals are considered (promotion of social interaction and development of desirable group dynamics, promotion of psychological or moral development).

I believe that the research of the 1980's will include much more attention to such affective outcomes and the teacher behaviors that may be associated with them. Considerable progress has been made already in linking classroom reward structures and activity structures to patterns of social cooperation and interaction among classmates (Sharan, 1980; Slavin, 1980). We need more attention to individual affective variables

such as attitudes toward subject matter and school work, intrinsic motivation to learn, self evaluation and reinforcement, and pride in accomplishment.

Progress is likely to come in these areas not merely because investigators are developing interest in them, but because new data collection methods are being introduced. In the past, social and especially personal development have been measured with questionnaires and other structured self-report instruments, with mostly unsatisfactory results. Too often, the data collected with such instruments represent not so much students' genuine perceptions, attitudes, or beliefs as the operation of response sets tangential to the affective variables supposedly being measured. When allowed to make more than two choices in responding to an item, some students regularly use the extreme categories, and other students regularly avoid them. Many students will give answers that they think will please the teacher or the test administrator rather than report their true perceptions or attitudes. Many students will project in a defensive or ego-enhancing way, claiming to be much happier or successful than they really are. These and other factors introduce so much noise into students' responses to structured self-report instruments as to render those responses virtually useless as data.

Recently, however, investigators interested in students' affective development have begun to collect data that may be more valid. Some (Weinstein & Middlestadt, 1979; Rohrkemper, Note 5) have used open-ended interviewing, in which students are encouraged to report their perceptions in their own words. Others have employed extended and "thick description" forms of observation to determine how students function in group situations (Webb, 1980) or respond when they are unable to solve a

seatwork problem (Anderson, Note 6). Still others have investigated affective outcomes as they are perceived and defined by teachers, based on their experiences, rather than by psychologists, based on theory (Prawat, 1980).

Explaining Process-Outcome Linkages

Most of the process-outcome linkages established by the research of the 1970's remain purely empirical. That is, even when we know that certain teacher behavior is associated with higher levels of student learning, we do not know why. Sometimes the answer is (or at least seems) obvious, as in the case of classroom management skills that increase the percentages of time that students are engaged in academic activities. The reasons for other relationships are less obvious. For example, I noted earlier that teachers in the early grades who run their small group recitations by calling on students in a patterned order tend to be more successful than teachers who call on students randomly, and suggested several possible reasons why this might be so. These are purely speculative, however; no one has investigated the matter systematically. Nor is it clear why whole class instruction is usually more effective than small group instruction after the first few grades, why teachers in the early grades who praise more often tend to be less effective than teachers who praise less often (or why this relationship reverses in the higher grades), or why teachers who ask relatively more high-level questions tend to be less successful than teachers who ask fewer high-level questions.

Progress in clearing up such mysteries will require research designed to identify the reasons underlying process-outcome relationships. This again brings up the need for thick description and for attention to process-process relationships in addition to process-outcome relationships.

For example, consider the finding that teachers in the early grades who praise more often tend to be less successful in producing learning than teachers who praise less often. Is this a direct and specific effect of the praise itself, or are differences in praise frequencies associated with other teacher differences that may be more fundamental? Perhaps teachers who praise "too often" are prone to praise inappropriately by offering positive comments when the performance does not deserve them. (If so, this may erode their credibility with the students. In any case, it raises questions about the teachers' intelligence or social perceptiveness.) Perhaps teachers who praise frequently tend to be more interested in affective than in cognitive objectives, so that the process-outcome relationships spring from teacher values rather than necessarily from teacher abilities. Until studies providing thick description of how teachers who differ in praise frequency both teach in general and praise in particular become available, we remain unable to choose between these and other possible explanations for the process-outcome relationships involving praise.

Another problem with the research of the 1970's is that it is based on the natural variation existing among contemporary teachers on the process variables studied. When all teachers perform certain behaviors either well or poorly, the restricted variation in the behaviors will prevent them from correlating significantly with outcomes, even when they may be important (cf. Anderson, Evertson, & Brophy, 1979). Even where there is good variance among teachers, so that significant correlations are obtained, these data do not yield specific guidelines for instruction. To stay with our example, data from the early grades indicating a negative

relationship between praise and student learning suggest that less effective teachers praise "too often," relative to more effective teachers. Even if this correlational relationship should prove to result from a direct causal link between frequency of praise and student learning (which seems unlikely), it does not provide specific guidance to teachers. How much praise is too much? What is the optimal amount? Attempts to answer these questions would require examination of plots and regression lines, not mere reporting of correlational relationships.

Furthermore, even if such analyses were completed and yielded reasonably specific guidelines about frequency of praise ("Praise 10% of correct answers."), the resulting guidelines would be silent regarding when and how to praise. More complete guidelines would require attention to the target of the praise ("Save your praise for brilliant or creative answers or for completed work that results from considerable effort."), the nature of the student ("Concentrate praise on students who seem to need it and respond well to it; praise performance that represents noteworthy progress or accomplishment for this particular student, even if more talented peers do better."), the setting or context ("Minimize praise during public, whole class lessons and recitations, because it distracts from the lesson and may embarrass certain students."), and the phrasing of the praise itself ("Praise should be contingent upon specific accomplishment and should call attention to this accomplishment by describing it."). So far, most process-outcome research has confined itself to measuring only the frequency of teacher-behavior variables, without building in the qualitative and context-specific distinctions implied in these guidelines for praising. Such guidelines can be derived from theoretical sources

and from other kinds of classroom data (Brophy, in press), but they cannot be observed or tested in process-outcome research until such research begins to introduce even more complex and sophisticated methods of observing, coding, and analyzing teacher behavior.

The Research of the 1980's

The process-outcome research of the 1970's has convincingly linked a complex of variables involving classroom management and organization skills, direct instruction, and student engagement/time on task to students' residual gains on end-of-year standardized tests of basic skills. This has been an important contribution. However, as I have noted elsewhere (Brophy, 1979b), additional studies with the same general research design are doomed to continue replicating these basic relationships without adding important new findings. The problem is that teacher differences on the classroom management/direct instruction/student-engagement cluster are so basic and far reaching as to mask the effects of more restricted or subtle variables such as the sequencing and clarity of presentations or the teacher's style of questioning and delivering feedback to students. Consequently, researchers interested in process-outcome linkages will be shifting to new paradigms in the 1980's.

To investigate subtle instructional variables efficiently, it will be necessary to control or at least limit the variation in teachers' classroom management skills and time spent in direct instruction, and to shift from studying effects across a school year on end-of-year achievement tests to studying immediate or at least short-term outcomes of instruction. In

addition to performance on tests, these outcomes will include student behaviors traditionally classified as process variables rather than product variables: attention to teacher presentations, performance during recitations, engagement in seatwork assignments, and so on. Even where test data are used, the emphasis will switch from broad, norm-referenced tests to much briefer criterion-referenced tests for mastery of the specific content taught during the periods of instruction under study.

Some of this work will be experimental, as in the recent series of programmatic studies on teacher clarity conducted by Land and Smith (1979). Most of the work will probably still be naturalistic. In either case, it will be important to move beyond the familiar but largely uninformative decision-oriented evaluation study (Which is more effective, method A or method B?), and begin to address more sophisticated process-outcome questions (What are the similarities and differences in the effects of method A and method B? Are there trade-offs, such that method A is more effective for certain objectives but method B is more effective for other objectives? If one method is better than the other, why is this so--what are its immediate effects on students during actual instruction that seem to explain the performance differences observed later on the test?).

I believe that the research of the 1980's will begin to address these questions systematically, and in the process, will start to achieve the first real integration of research on teaching with research on learning. In order to analyze and explain why teacher behaviors have the effects that they do on students, it will be necessary to link teacher behaviors

to immediate and short-term student outcomes such as mathemagenic[3] behaviors, attention and task engagement, success rates, response sets, and error patterns. As researchers studying teaching pay more attention to context, especially to teachers' immediate goals, we should begin to see more specific identification of relevant, student-behavior variables and specification of ideal student outcomes. Influenced by Doyle (1977) and others who have taken an ecological perspective in analyzing classrooms and arguing for balancing the emphasis on the teacher with an equal focus on the student, researchers studying teaching have begun to analyze the performance demands that different teaching behaviors impose on students. This may be only the first step in what will eventually become a genuine integration of research on teaching with research on learning.

Integration with Research on Learning

While these events are occurring in research on teaching, some parallel changes have been occurring in research on curriculum organization and learning. Traditionally, researchers interested in the application of the ideas of learning theorists such as Gagné, Glaser, or Keller have concentrated their efforts on curriculum development. In particular, there has been a focus on the form and organization of curriculum rather than

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[3] Mathemagenic activities are student behaviors relevant to achievement of instructional objectives: attending or orienting to relevant input, processing the input and translating it into internal speech or representations, segmenting the input into meaningful units, and so on.

upon its delivery to the learner. The result has been an accumulation of knowledge about how traditional instructional materials (text books, workbooks) can be improved, supplemented, or even replaced by innovations such as programmed texts, audiovisual instructional systems, or computer-directed learning. Researchers in this tradition have had little to say, however, about the "delivery system" which has always been dominant at the elementary and secondary level and is likely to remain so in the future: the classroom teacher.

This, too, is changing. Researchers from the learning and curriculum development tradition have largely abandoned the notion of developing a "teacher proof" curriculum and have begun to turn serious attention to study of the teacher behaviors involved in curriculum implementation. The DISTAR program, for example, includes a model of instruction along with curricula and materials in its learning program. Recent experimental work done in classrooms implementing the DISTAR program has yielded useful information about the nature and sequencing of examples used to introduce concepts (Carnine, 1980) and about teacher control of lesson pacing and error rates (Carnine, 1976). McKenzie and Henry (1979) have shown that teacher presentations of the same content tend to be more effective when they include "test-like events" that require each individual in the class to respond actively than when they merely require the majority of individuals to passively observe while a few peers respond.

Just as educational psychologists concerned with learning and curriculum development have become interested in teacher behaviors, developmental psychologists have become interested in children's cognitive functioning. Case (1975, 1978), for example, has developed guidelines for gearing the demands of instruction to the developmental capacities of learners. Blank

(1973) has considered the types of questions and performance demands that may be needed for effective instruction of inhibited or uncommunicative young learners. Zimmerman (Zimmerman & Jaffe, 1977; Zimmerman & Blotner, 1979) has studied modeling as an instructional strategy.

In general, then, process-outcome researchers are becoming more interested in learner variables just as educational and developmental psychologists are becoming more interested in teacher variables. The development and merging of these interests should fuel a major trend in the 1980's: research on teaching that springs from concern about the thinking and behavior that the teaching is supposed to stimulate in students (that is, the immediate outcomes of teaching as observed in students' process behaviors). This emphasis is sorely needed, especially in research on seatwork and remedial instruction.

Heretofore, research on teaching has concentrated on teacher-student interaction during public lessons and recitations. Yet, students in most classrooms spend more than half of their time in seatwork (Rosenshine & Berliner, 1978; Fisher, et al., Note 4). We need much more information on the kinds of seatwork that are appropriate and on how teachers can effectively present the seatwork to students, monitor their performance, and provide feedback as needed. Anderson (in progress) has begun to address this problem.

Little is known about effective remedial instruction either. The diagnoses and prescriptions of supposed experts (specialists in learning disabilities, remedial teaching, and related fields) are not even reliable, let alone established as valid or effective (Weinshank, Note 7). Curriculum guides and teachers' manuals do not provide much help here (typically they assume implicitly that students will learn without difficulty;

in any case, they present little or no advice on what to do when difficulties arise). Recent work in reading and mathematics learning has begun to focus on the heuristics that students devise for comprehending curriculum content and responding to practice exercises, and on the kinds of errors they are likely to make (and the reasons for them). Much more information is needed on how teachers can identify the processes students are using to respond to content, diagnose students' errors, and respond with effective remedial teaching. Some of this research will be content specific to the point that it will be of interest only to subject matter specialists. However, it seems likely that several general types of student confusion can be identified, leading to the development of specific principles for teacher response to each type. Eventually, this type of research should produce guidelines that teachers can use to respond to questions such as the following. When should teachers withhold help and merely require or encourage students to overcome confusion on their own? When should teachers give the answer? When should they give clues that will provide help to the students but still require them to generate at least part of the solution on their own? What kinds of clues are appropriate (and are some kinds counterproductive)? What are the key differences between responding to a student who understands the process but has made a mechanical error versus a student who has used an incorrect process versus a student who has missed a key item of information versus a student who is completely confused and does not even know how to begin?

The Role of Teacher Values, Judgment, and Decision Making

Raising such questions serves as a reminder that teaching is highly complex, involving constant monitoring of learner response and adjustment to deal with whatever contingencies arise. Research on teaching can inform

teachers about the probable outcomes of their decisions, but cannot make those decisions for them, even within the relatively restricted domain of decisions solely concerned with maximizing student learning (without consideration of other worthy objectives).

So long as teachers must deal with classes of 25 or 30 students instead of tutoring single individuals, there will be trade-offs between meeting the needs of any individual and meeting the needs of other individuals or of the class as a group. This necessarily requires the application of values, and not just skills. Thus, although teaching can and should become much more of a data-based applied science than it is now, it will always remain at least partly a clinical profession involving planning, judgment, and decision making.

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